

REMARKS

Claims 7, 8, 11 and 12 were rejected under 35 U.S.C. §102(b) as being anticipated by Feulner et al. (US Patent 6,366,393). Applicant respectfully traverses this rejection.

In the instant application, over- and under-shoots can be nearly eliminated if the pump power required to maintain the gain after a change in the input signal is already known at the time of the change of load at the input. Calculating the pump power in advance to have an optimum accuracy is, however, very difficult. Moreover, the magnitude of the over- and under-shoots decreases with increasing accuracy of the estimation of the required pump power.

Feulner references maintaining a “relatively constant per-channel gain”. That is, the reference proposes a method for calculating the pump powers so that variations of gain curve, and hence of the per-channel gain, can be kept relatively small. In the claimed invention, on the other hand, the pump powers are calculated dependent upon the wavelength such that the variations of gain curve or per-channel gain in terms of “wavelength dependent gain curve” have to be considered and reduced. In Feulner, $P_{\text{pump}} = C_1 + C_2 \times P_{\text{in}}$ is used to calculate the required pump power. However, the accuracy of the predicted value is improved by taking into account the dependence on amplifier gain. This is achieved by adapting the coefficients to the gain of the amplifier by means of a microcontroller. Nevertheless, the predicted value suffers from some significant inaccuracies since the other effects are still neglected. It is important to note that in Feulner, there is no disclosure that the coefficients C_1 and C_2 , as well as the input parameter into the equation P_{in} (which is a total measure power of the WDM signal) are wavelength dependent. Additionally, use of wavelength dependency is not possible to take into account in Feulner since there is no measurement device or method available that could provide the required wavelength information.

The invention increases the accuracy of the predicted value by taking into account various effects. In this way, the over- and under-shoots are reduced. This is accomplished, for example, by:

1. Wavelength dependency of the required pump power is taken into account. This is achieved by using the amplifier itself as a wavelength dependent measurement device.

2. The pump power required to maintain the gain after a power drop is calculated relative to the pump power adjusted by the slow feedback control under stable operating conditions (constant input power). Thus, aging effects are continuously taken into account.
3. Nonlinear effects are taken into account since the model used is directly adapted to the physical phenomena in the optical fibers.

Significantly, Feulner relies on the fact that feed-forward controls become more effective the faster the adaptation of the pump power is performed. However, the claimed invention measures total input and output power of the amplifier directly after the changes of the input power. This measurement makes use of the fact that the gain curve of the amplifier does not change within the first microseconds. Thus, the amplifier itself acts as a measurement device that provides the response of the target gain shape to the changed input power. With this information, and the corresponding total input and output power values measured before the input power change, the required pump power can be calculated with significantly increased accuracy. For example, claim 7 requires calculating a state of gain curve for amplification of new input channel powers, and the accumulated input and output power is measured, and a new pump power value is determined in a wavelength dependent manner so that a wavelength dependent gain curve of the amplifier becomes substantially constant.

For at least these reasons, Applicant submits the rejection under 35 U.S.C. §102 is traversed, and earnestly requests the withdrawal of same. In light of the present amendments and arguments, Applicant respectfully submit that claims 7-13 are allowable. Applicants respectfully submit that the patent application is in condition for allowance and request a Notice of Allowance be issued. The Commissioner is authorized to charge and credit Deposit Account No. 02-1818 for any additional fees associated with the submission of this Response. Please reference docket number 119010-355.

Respectfully submitted,
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